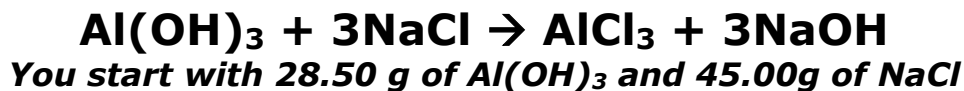


Limiting Reagent Walk-Through – Example #2



How many grams of NaOH can you make, and how many moles of the excess (XS) reagent do you have left when done?

STEP #1 - Grams to Moles

Use molar masses to convert from grams to moles:

28.50 g		1 mol	=	0.365 moles		75.00 g		1 mol	=	1.283 moles
Al(OH)_3		Al(OH)_3		Al(OH)_3		NaCl		NaCl		Al(OH)_3
		78.00 g						58.44 g		
		Al(OH)_3						NaCl		

STEP #2 – Have versus Need

Make a little chart showing how many moles of each chemical you have versus how many moles of each chemical you would need. Pick one of your starting values (doesn't matter which one – I like to just pick the first one so I'm consistent), do dimensional analysis to figure out how many moles of the other chemical you would need to have in order to complete the reaction.

$\text{Al(OH)}_3 + 3\text{NaCl} \rightarrow \text{AlCl}_3 + 3\text{NaOH}$					
HAVE:	0.365 mol	1.283 mol			
NEED:		1.095 mol			

0.365 mol		3 mol	=	1.095 moles H_2
Al(OH)_3		NaCl		would be needed
		1 mol		to use up all the N_2
		Al(OH)_3		

STEP #3 – Identify Limiting

Compare the amount you have with the amount you need to see which chemical you don't have enough of, and which chemical you will have extra left over of.

$\text{Al(OH)}_3 + 3\text{NaCl} \rightarrow \text{AlCl}_3 + 3\text{NaOH}$		
HAVE:	0.365 mol	1.283 mol
NEED:		1.095 mol

You can see here that you have 1.283 mol of NaCl , but you would only need 1.095 mol to use up all the Al(OH)_3 you have. So you have more than enough NaCl , you will have extra left over. That means NaCl is the excess reagent, and that Al(OH)_3 is the limiting reagent.

STEP #4 – Do Stoich with Limiting

Convert from moles of limiting reactant to desired unit of unknown substance asked for in the problem – use mole highway to determine where to start and end. It is now just a normal stoichiometry problem once you know which number to use!

Example pathway: moles of A → moles of B → grams of B

	LR	XS	
	$\text{Al}(\text{OH})_3$	$+ 3\text{NaCl}$	$\rightarrow \text{AlCl}_3 + 3\text{NaOH}$
HAVE:	0.365 mol	1.283 mol	
NEED:		1.095 mol	

0.365 mol	3 mol	40.00 g	= 43.8 g NaOH made during the rxn
$\text{Al}(\text{OH})_3$	NaOH	NaOH	
	1 mol	1 mol	
	$\text{Al}(\text{OH})_3$	NaOH	

STEP #5 – Find XS left

Use moles of Limiting Reagent and mole ratio to calculate how many moles of Excess Reagent are needed to use up all the limiting reagent during the reaction. Add this value to the little chart that you already made. Then, just subtract to find how many moles of XS are left over.

	LR	XS	
	$\text{Al}(\text{OH})_3$	$+ 3\text{NaCl}$	$\rightarrow \text{AlCl}_3 + 3\text{NaOH}$
HAVE:	0.365 mol	1.283 mol	
NEED:		1.095 mol	

LEFT:	1.283 mol	
	- 1.095 mol	
	= 0.188 mol	of NaCl left as excess

This time you already know the moles of XS you have and the moles of XS needed to use up all the limiting reagent! So you can skip straight to subtracting.

Convert your answer into whatever unit is asked for – if it doesn't specify then it is ok to leave it in moles.

It only asked for moles, so there is no need to convert our answer to grams!
You are done!